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Amdt. Dated August 30, 2004
Reply to Office Action of July 9, 2004

REMARKS/ARGUMENTS

Prior to this Amendment, claims 1-15 were pending in the application.

Claims 1-7 and 9 are canceled.

Independent claim 8 and dependent claims 10 and 11 are amended to emphasize features of a method of joining a cluster according to an embodiment of the invention that are not shown in the art of record. Claim 9 is canceled with its limitations being added to claim 8. No new matter is added by these amendments with support being found at least in the original claims, Figure 2, and the specification beginning with the first full paragraph of page 9.

Independent claim 12 is amended to clarify that the claimed viability monitoring for cluster members comprises identifying a master node and providing a heartbeat with the master node to each of the members. This technique of reducing monitoring signal traffic is not shown by the art of record. No new matter is added with support found at least in Figure 3 and the corresponding portions of the application.

New claims 16-18 are directed to a system for monitoring cluster membership and are added to protect features of the invention not shown by the art of record. No new matter is added with support being found in the original claims and Figures 1 and 3.

Claims 8 and 10-18 remain for consideration by the Examiner.

Rejections Under 35 U.S.C. §102

In the July 9, 2004 Office Action, claims 1-15 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Pat. No. 6,532,494 ("Frank"). Claims 1-7 and 9 are canceled. The rejection of claims 8 and 10-15 is traversed based on the amendments to independent claims 8 and 12 and the following remarks. In the following remarks, Applicants first present reasons for allowing claims 12-15 over Frank, and then present a discussion of features of claims 8, 10, and 11 that are not shown or suggested by Frank.

The Office Action cites Frank at col. 5, lines 63 to col. 28 (which appears to be a typographical error) for teaching using a master node to provide a heartbeat. Applicants argue that instead Frank teaches two viability monitoring techniques that both differ significantly from the method of claim 12. In the Background at col. 2, lines 5-14, Frank teaches that prior network cluster systems monitored viability by having every node send a heartbeat to every other member of the cluster (an "open loop arrangement"). Frank teaches this is undesirable because it creates a large volume of signal traffic. To reduce traffic, Frank teaches in Fig. 3 and beginning at line 6 of col. 5 the use of a "status cascade 40" in which each "node transmits a single heartbeat message to its next node and receives a single heartbeat message from its previous node." There is no teaching that a master node (such as Frank's "coordinator node" discussed in col. 7) issues a heartbeat to each node in the cluster. For at least this reason, Frank fails to support a rejection of claim 12 under 102(e).

Additionally, Frank fails to show or suggest a method for monitoring the viability of cluster members that reduces the number of heartbeat signals or monitoring traffic required to maintain an accurate listing of viable cluster members. Specifically, Frank does not teach a method that includes identifying one of the cluster members as "a master node" and then, "providing a heartbeat by the master node to other ones of the cluster members." Frank fails to teach the identification of a master node that is then used to provide heartbeat messages to the other cluster members. Hence, Frank fails to support the rejection of claim 12, and this rejection should be withdrawn.

The Office Action cites Frank at col. 7, lines 27-37 as teaching viable nodes that respond to a heartbeat if the heartbeat is received within a peer node time-out period, and if not, a reformation of the cluster members is initiated. At this citation, Frank discusses making updates to a "cluster definition" but fails to teach that viable nodes respond to a heartbeat only if the heartbeat is received within a particular time-out period. Also, Frank fails to suggest that if the heartbeat is not received within this time period, a cluster reformation is initiated. In contrast, Frank

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teaches at col. 5, lines 55-61 that the closed loop cluster is transformed back into an open loop arrangement when any of the nodes "fail to receive a heartbeat message from its previous node." This does not teach or suggest the processes performed by the viable nodes of claim 12. For this additional reason, Frank does not support a rejection of claim 12.

Claims 13-15 depend from claim 12 and are allowable at least for the reasons for allowing claim 12. Further, with regard to claim 13, Frank fails to show that the master node verifies that each of the other nodes has responded to the heartbeat and does not specify actions to take after such verification. Frank does not teach that its coordinator node transmits a heartbeat to each member, and therefore, cannot teach the verification of a response to such a heartbeat by each member. Claim 15 defines how reformation is performed and includes determining a master node priority for each of the viable nodes and electing the node with the highest priority as the new master node. The Office Action cites Frank at col. 7, lines 21-331 for teaching how to elect a new master node. However, Frank merely states that any method can be used, and this does not teach or suggest the method of claim 15. Further, Frank gives examples where the coordinator node is simply the first to join the cluster or is selected by their node ID. As shown in Applicants' Fig. 1, the master node priority 34 for each node is provided in addition to the node ID 30. Hence, Frank fails to anticipate each element of claims 13 and 15, and the rejection of claims 13 and 15 should be withdrawn.

Frank further fails to teach or suggest the claimed method for enabling nodes to join a cluster. In this regard, the Office Action cites Frank for teaching each and every element of the independent claim 8 method for joining a cluster. However, Frank fails to show at least the processes of starting a local cluster membership monitor entity on a node when it boots. Frank does not teach that the local membership entity establishes contact with similar entities on peer nodes of the cluster, and a consensus protocol is performed with the booting node and the found peer nodes. Further, Frank fails to show that when a consensus is achieved, its method does or should include determining if one of the peer nodes is a master,

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and if so, then the booting node joins the cluster. Because Frank fails to teach these elements, Frank does not support a rejection of claim 8 under 102(e).

More particularly, the Office Action cites Frank at col. 7, lines 27-37, col. 10, lines 44-51, and col. 7, lines 11-37 for teaching a new node contacting existing cluster members, performing a consensus protocol, determining if a master node exists in the existing cluster members, and if so, joining the cluster. At col. 7, lines 27-37, Frank teaches that a "coordinator node" has write privileges to a cluster definition and at col. 7, lines 11-37, Frank teaches that a node that is attempting to join the cluster can access the cluster definition. However, Frank provides no teaching that a new node would act to determine if an existing node is the coordinator node and when it successfully makes such a determination, that it would join the cluster. Hence, Frank does not teach or suggest each element of claim 8, and the rejection of claim 8 should be withdrawn.

Further, at col. 10, lines 44-51, Frank discusses how a process for resolving a partitioned cluster can be performed with reference to Fig. 7 (such as with the use of figures of merit). Frank provides no discussion of a potential cluster member and existing cluster members performing a consensus protocol and only when a consensus is achieved, enabling the potential cluster member to join the cluster. For this additional reason, Frank does not support a rejection of the method of claim 8.

Claim 10 and 11 depend from claim 8 and are believed allowable as depending from an allowable base claim.

Claims 16-18 are directed to a system that includes limitation similar to that of claim 12 written in system form. Therefore, the reasons presented for allowing claim 12 over Frank are equally applicable to claims 16-18.

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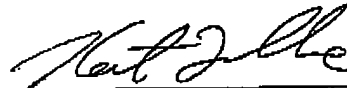Reply to Office Action of July 9, 2004

Conclusions

The additional references cited in the Office Action but not relied upon by the Examiner have been considered but are believed no more relevant than Frank.

The pending claims are in condition for allowance, and Applicants request that a timely Notice of Allowance be issued in this case.

No fee is believed due with this Amendment. However, any fee deficiency associated with this submittal may be charged to Deposit Account No. 50-1123.

Respectfully submitted,

August 30, 2004

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